

Title: CORAL POPULATION DYNAMICS IN THE FULLY PROTECTED ZONES OF THE FLORIDA KEYS.

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Project Summary: The coral reefs of the greater Caribbean region including the Florida Keys have declined markedly over the past few decades, as manifested by decreases in coral cover and diversity and increases in benthic algae. The Florida Keys National Marine Sanctuary (FKNMS) and EPA, in cooperation with the state of Florida, developed a management plan which was implemented in 1997. One of the key features of the management plan was the establishment of a number of Fully Protected Zones (FPZs).

Beginning in October 1997, a hypothesis-based study of the ecological processes involved in reef recovery was initiated by comparing shallow and deep sites at three pairs of FPZs and adjacent Reference Sites in the Upper and Lower Keys. In 2002-03 another pair of FPZ and reference sites was added in the Upper Keys. The major elements of the study were: (1) coral cover and diversity through time; (2) the importance of herbivory in controlling the biomass of benthic algae; (3) the relationship of herbivory and coral recruitment; and (4) mortality rates of juvenile corals. Analysis of data from 1998-2002 shows stable coral populations at all sites with no increases in coral cover and diversity. Coral recruitment has been generally increasing over time but there was also significant juvenile coral mortality associated with storms. Algal biomass and herbivory are highly variable and do not appear to affect coral recruitment rates and that component of research was concluded in 2001. Importantly none of the results pointed to any significant effect of the FPZs.

There are three key questions with regard to the future of the coral reefs in the FKNMS: (1) Will the coral assemblages recover and will they revert to their composition prior to recent disturbances? (2) Are the recruitment and survival rates of key reef-building corals adequate to

maintain their populations and allow for recovery and long-term sustainability? (3) Can scientifically informed management, specifically FPZs, influence the reef recovery process? The goals of this proposal are to continue and expand our study with more focus on coral population dynamics and the refinement of population models for key reef-building species, *Montastraea* spp. In conjunction with broad-scale, video-based reef community studies, changes in the size frequency distribution of *Montastraea* spp. will be tracked through a time series analysis. The study of coral recruitment and juvenile coral mortality will be expanded to look at survival and growth rates of large *Montastraea* spp. colonies in permanent quadrats, as well as very large colonies in the study areas.

Relevance to
Restoration and/or
Resource
Management:

A key product of this proposal will be a more robust size-structured population model to predict future coral population trends in the FKNMS and, thus, provide a finer assessment of the efficacy of the FPZs in sustaining coral growth. Coral reef recovery under management is essential to sustainable use of this biologically diverse and economically valuable marine resource.

Geographic Area:

Florida Keys National Marine Sanctuary.